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Breast Imaging

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The diffraction enhanced imaging method (DEI) is an evolving imaging modality able to generate contrast from X-ray absorption, refraction, and ultra-small-angle scatter rejection (extinction). The application of DEI to breast imaging using synchrotron X-ray sources has demonstrated significant gains in feature visualization when compared to conventional radiography. A DEI system based on a tungsten X-ray tube has recently been developed; this system is able to generate all three DEI contrast mechanisms in a compact format with the potential for widespread clinical application. This initial prototype is based on a 1 kW tungsten X-ray tube using the $K\alpha 1$ (59.318 keV) and $K\alpha 2$ (57.982 keV) characteristic emission lines with a 50- to 100-fold decrease in the absorbed radiation dose when compared to conventional radiography. A recent radiologist reader study comparing this compact DEI prototype to synchrotron-based DEI demonstrates equivalent visualization of masses and calcifications, further validating the design for potential clinical application. A full-power clinical prototype is currently under development with the eventual goal of clinical implementation for breast imaging.